

APPLICATION FOR UNITED STATES LETTERS PATENT
FOR

PALM OFFICE ASSISTANTS

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PALM OFFICE ASSISTANTS

Darwin Hu

BACKGROUND OF THE INVENTION

Field of the Invention

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The present invention relates to portable optical scanners, and more particularly to a method and system for capturing alphanumeric characters, symbols or biometric tokens (i.e., fingerprints) with low cost point optical scanners integrated with portable computing devices such as palm sized computing devices, personal digital assistants (PDA's), smart phones and cellular phones with digital network connectivity (i.e., WAP phones).

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Description of the Related Art

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Personal Data Interchange (PDI) occurs every time two or more individuals communicate, in either a business or personal context. Such interchanges frequently include the exchange of information containing alphanumeric characters and symbols, such as business cards, purchase receipts, tickets, contracts, and other types of documents. To manage the amount of information gathered via PDI many individuals use portable hand-held computing devices such as handheld computers, personal digital assistants, smart phones and WAP enabled phones with limited user interfaces, limited power resources and limited computing and memory resources.

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Capturing the data into a portable computing device with limited user interfaces has always been a challenge. One of the popular portable

5 computing devices (e.g. a palm handheld from Palm, Inc.) provides a
writing pad from which a user can write in texts letter by letter. Typically, it
takes minutes to input relevant information from a business card into such
device. Although such input is tedious and laborious, a portable computing
device provides more conveniences that have outweighed the awkward
10 input mechanism.

Many business cards have a symbolic emblem or a graphic logo
beside a name, a title, one or more phone numbers, an e-mail address.
One of the purposes for such graphic logo on a business card is to leave a
recipient of the business card a strong impression of the business
15 entity/relevant services/products implied in the business card. The above
text-based input, however, would discard the graphic logo, which is
certainly not desirable by a business entity in a business card.

There is therefore a need for a portable device that facilitates an
easy input mechanism so that a user can read in text information as well as
20 graphic information.

SUMMARY OF THE INVENTION

To be finished after your review.

The foregoing and other objects, features and advantages of the
invention will become more apparent from the following detailed description
25 of a preferred embodiment, which proceeds with reference to the
accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

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Figure 1 is a block diagram of a personal digital assistant having a connected pen scanner which may be used to implement the method and system embodying the present invention;

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Figures 2A and 2B illustrate a Personal Digital Assistant having an integrated business card scanners which may be used to implement the method and system embodying the present invention;

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Figure 3 illustrates a functional block diagram of the functional hardware components associated with a representative wireless communications device which may be used to implement the method and system embodying the present invention;

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Figure 4 illustrates a functional block diagram of the functional software modules associated with a representative wireless communications device which may be used to implement the method and system embodying the present invention;

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Figure 5 illustrates a representative screen display indicating the results of post capture processing of finger print information in accordance with an embodiment of the present invention;

5 **Figure 6A** shows a diagram in which a palm office assistant may communicate with a personal computer, a wireless network or a general computing device;

Figure 6B shows an exemplary contact image sensor that may be used in a linear scanner to be integrated with a portable computing device;

10 **Figure 7** is flow diagram of the process associated with the rule based processing of the captured components in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

15 The invention pertains to portable devices equipped with methods and systems for capturing, processing, storing and augmenting alphanumeric characters, symbolic data, graphic and biometric representations resident on documents. The portable devices may include, but not be limited to, a palm sized computing device, a personal digital
20 assistant, a smart phone and a data network enabled cell phone. According to one aspect of the present invention, a linear scanner is integrated with a portable device and serves as an input mechanism for the portable device to scan in texts, alphanumeric characters, symbolic data, graphic or biometric representations. Specifically, contents resident on documents are
25 scanned in (i.e. captured), classified and processed using type-specific software modules resident on the subject portable device or on accessible remote server devices. One of the advantages and benefits provided in the

5 present invention is a portable or palm office assistant, incorporating some of the basic office utilities into a portable device.

10 The detailed description of the invention is presented largely in terms of procedures, steps, logic blocks, processing, and other symbolic representations that directly or indirectly resemble the operations of data processing devices coupled to networks. These process descriptions and representations are typically used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art. Reference herein to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

25 Referring now to the drawings, in which like numerals refer to like parts throughout the several views. **Figure 1** shows a basic system configuration in which the present invention may be implemented in accordance with a preferred embodiment. Personal Digital Assistant (also referred to as a PDA herein) **102** has connectivity to a wireless communications data network (not shown) such as a Wireless Access Protocol network and is connected to ScanPen **106** via a serial connection port such as a USB port. It would be understood by one of ordinary skill in

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5 the art that the present invention may be practiced using a personal digital assistant with an integrated scanning device or a scanning device connected to the personal digital assistant by a short range wireless communications means (i.e., Bluetooth or Infrared).

10 ScanPen **106** is a pen-sized, beam scanning, information collection device that includes a sensor and an associated optical apparatus that collects and focus lights reflected from a document onto the sensor. ScanPen **106** may function as a 1D or 2D scanner depending on the configuration of the sensor. In operation, a user holds ScanPen **106** and moves it across a text printed on a document. As a result, an image of the text is then captured. The image may be transported to PDA **102** for Optical Character Recognition (OCR) if PDA **102** has enough computing resources. 15 Optionally, ScanPen **106** has embedded language specific optical character recognition engine (i.e., an ASIC) which performs onboard OCR processing thereby relieving PDA **102** of a portion of the processing burden when processing characters. 20

According to one embodiment of the present invention, document **110** containing text **112** and a graphic logo or fingerprint **114** may be scanned in using ScanPen **106**. Text **112** is processed by the embedded OCR processing module resident within ScanPen **106** and subsequently 25 processed by an application module resident on PDA **102**. In other words, texts in the scanned image are first optically recognized and then forwarded to PDA **102**. The application module in PDA **102** may parse the recognized texts and then extract text sets in accordance with a set of predefined rules. When text **112** is off a business card, first and last names, phone numbers,

5 addresses and e-mail addresses can be extracted and filled into
appropriate fields on a record.

Graphic print **114** can be also scanned in and may be converted to a
Fourier Transformed Image for identification matching if it is a personal
finger print. Software modules resident on PDA **102** or a remotely
10 accessible server device may perform the Fourier processing. If graphic
print **114** is a general graphic representation, the scanned image may be
retained and placed in an appropriate field, if there is one, in a record.

According to one aspect of the present invention, a user could
capture the content on a document of interest, store portions of that
document in discrete applications (i.e., e-mail contact list, address books
etc.) and definitively confirm the recognition of the document by looking at a
display screen **116** of PDA **102**. Upon process initiation, software modules
resident on the terminal device or embedded as an applet or an application
cause a series of screen displays and associated network interactive events
15 (i.e., identity confirmation) to occur. The captured images and event
indications may be supplemented with validation information (i.e., a time
stamp, a user specific electronic signature and validation information which
may take the form of alpha numeric character strings or machine readable
marks) and then processed for storage and future display. This information
20 may be stored locally and/or on a designated remote server device for
future reference.

It is defined without the loss of generality that an interaction involves
activities (i.e., display content, user input/output in response to what is
being displayed in the subject terminal device) performed by a user with

5 respect to the user interface of a terminal device that may or may not be
 networked. Some advantages of the present invention include the ability to
 archive documents of interest and the ability to validate the identity of those
 presenting the documents. Additionally, ScanPan **106**, which may be
 powered by PDA **102**, can be designed a lot simpler than those seen in the
 10 market to perform language translation.

Figures 2A and 2B illustrate a PDA **202** having an integrated
 business card scanners **206** which may be used to implement the method
 and system embodying the present invention. One of ordinary skill in the
 art will comprehend that multiple types of integrated scanners (detachable
 or non-detachable) other than the business card configuration shown may
 be used without deviating from the principles or scope of the present
 invention.

15 In **Figure 2A** a business card **208** containing text **210**, a symbol **212**
 and a fingerprint **214** is passed through business card scanner **206**. The
 content is captured and buffered for processing by application (or software)
 modules resident on PDA **202** or on accessible remote server devices. The
 resolution (i.e., dpi) of the captured image components may be re-
 configurable depending on the scanning object. For example if Fourier
 identity confirmation/fingerprint analysis is required then the resolution
 20 requirements will be higher than if only simple OCR is required.

25 Referring to **Figure 2B**, the image of the business card **224** has
 been captured and is optionally displayed on the screen of PDA **202**. Upon
 OCR processing and subsequent template matching, some of the captured
 contents have been associated with particular field types. <Jane W. Dow>

5 was recognized as a name, <Gourmet Coffee Service> was recognized as
 a company/service name, <650-550-4011> was recognized as a phone
 number and jdow@aol.com was recognized as an email address. Since
 these particular string types fit a certain profile, some functionality may be
 applied to them. For example, icon **218** is a link which will enable a phone
 10 call to be placed without having to dial the number, Icon **220** is a link which
 will automatically fill in the <To:> space for an e-mail. Additionally, icon **222**
 provides that a fingerprint image has been captured. The fingerprint image
 may be used for identity confirmation as will be further described below.

Figure 3 illustrates a functional block diagram of the functional
 hardware components associated with a representative wireless
 15 communications device which may be used to implement the method and
 system embodying the present invention. The device includes an
 integrated scanner **304** as described above, a microprocessor such as an
 ARM™ processor **308**, an LCD and associated control circuitry **312**, a user
 interface **316** (i.e., keypad/keyboard and a pointing device), power
 20 management circuitry **320**, memory **324** (RAM and ROM), a power supply
328 and a transceiver and associated circuitry for communication with
 wireless data networks (i.e., GSM, TDMA, CDMA, PCS etc.). All of the parts
 may communicate through a data bus controlled by the microprocessor.
 25 The detailed designs of the bus as well as respective interfaces of the parts
 to the bus are known to those skilled in the art.

Figure 4 illustrates a functional block diagram of the functional
 software modules associated with a representative wireless
 communications device which may be used to implement the method and
 30 system embodying the present invention. System configuration **400**

5 includes a device driver **404** which facilitates communication between the processing circuitry and an attached scanning device, an application program interface (API) **408**, a variable power management module **412** which maximizes *device alive time* between charges, scanner control module **416** which controls the available scanning modes (i.e., 1D, 2D, max
10 resolution etc.) depending on the power management scheme implemented by variable power management module **412**, and the various processing modules required to process distinct captured component types.

Optionally, fingerprint recognition control module **420** identifies captured content types corresponding to images of fingerprints and transforms those images (i.e., Fourier Transformed images) to a format that
15 can be processed for identity confirmation. Image compression module **424** compresses the captured content so as to maximize storage efficiency and transmission bandwidth utilization. OCR engine module **428** coordinates the activities of the embedded OCR processing element associated with the scanning mechanism (i.e., language selection, predictive text processing
20 etc.). Template matching module **432** matches distinct string types (i.e., names, phone numbers, email addresses) using pre-defined rules and implements usable links based on type classification (i.e., speed dialing a phone number by interacting with a link). Software module **434** and **438**
25 coordinate the configuration of the sensing elements in accordance to optimized configurations for scanning components (text or images respectively).

Figure 5 illustrates a representative screen display indicating the results of post capture processing of finger print information in accordance
30 with an embodiment of the present invention. In this illustrative example,

5 captured fingerprint image **506** is compared with previously stored transformed images housed at Trusted Third Party Service Provider (i.e., a certification authority) and if a match is found, selected information may be returned to the requesting entity. In the screen shot provided a picture of the individual **508**, the identity of the certification authority **510** and links to
 10 some commercial material provided by the person associated with the business card.

Figure 6A shows a diagram **600** in which a palm office assistant **602** may communicate with a personal computer **606**, a wireless network **608** or a general computing device **610**. Palm office assistant **602** may correspond to device **102** of **Figure 1** or device **202** of **Figure 2**. One of the features in palm office assistant **602** is the scanning mechanism that facilitates image scanning of a scanning object that may include texts and graphic representations. With the scanning mechanism, a user of palm office assistant **602** can input lengthy texts with ease, substantially solving the text input problem commonly seen on those portable devices without a full
 15 functional keyboard.

According to one embodiment, palm office assistant (POA) **602** employs a contact image sensor **620** as shown in **Figure 6B**. Referring now to **Figure 6B**, there is shown a cross section view of an exemplary contact image sensor module. A light source **622** provides illumination to a scanning object (not shown) under a cover glass **624**. For color scanning, Light source **622** provides 3 different illuminations, e.g. red, green, and blue lights, to the scanning object. The scanning object, not shown in the figure, may be a sheet of paper (e.g. a business card) placed face up and scrolled
 25 or moved across the cover glass **624** such that the scanning side is

5 illuminated by the light source 622. The cover glass 624 is transparent and provides a focus means for the paper to be properly scanned. When the light source 622 emits light onto the paper as indicated by 626, the light reflected from the paper through the cover glass 624 is directed at the optical lens 628 which is generally an array of erect graded index micro
 10 (cylindrical or rod) lens. It should be understood that the present invention is independent of the optical lens and the light source. The use of the particular light source and the lens array in this configuration facilitate the description of the present invention and impose no limitation thereof. Under the optical lens 628, there is an image sensor 630 comprising an array of photodetectors made of CMOS or CCD sensors. The array can be
 15 configured as one-dimensional array or two-dimensional array, often referred to linear sensor or area sensor respectively. It should be noted that the description herein is based on the linear sensor, those skilled in the art will appreciate that the principles of the present invention can be equally applied to the two-dimensional array as well. The optical lens 628 collects the reflected light onto the photodetectors that convert the reflected light to electronic signals proportionally representing the intensity of the reflected light. The electronic signals are then transferred to the data bus 632
 20 through a connector 634.

25 For a scanning object under cover glass 624 to be completely scanned, the scanning object and image sensor 630 have to move against each other. According to one embodiment, an optical encoder 636 is used to synchronize the motion of the scanning object with image sensor 630. In operation, a user may move a portable device integrated with a contact
 30 image sensor across one or more lines of text strings on a scanning object. A contact motion between the scanning object and the contact image

5 sensor causes optical encoder **636** to rotate so as to record the motion (i.e. speed). The recorded motion from optical encoder **636** is used to synchronize the generation of the image data. The detailed designs of the synchronization circuitry with an optical encoder is known to those skilled in the art and is not to be described herein to avoid obscuring aspects of the present invention. Alternatively, other motion mechanism may be used to
10 cause a relative motion between the scanner and a scanning object.

Returning now back to **Figure 6A**, after POA **602** receives the text information from the captured image(s), the text information may be transported via a cable (e.g. RS 232) to a personal computer **606** that may operate an application to store the text information for other practical uses. For example, the application on personal computer **606** is Microsoft Outlook that includes a contacts database. When the text information is from a business card, the text information may be parsed in POA **602** and appropriate contents are extracted and filled into related fields of a record. Hence POA **602** maintains the record for display when a user requests the record. The record can be then transported to the contacts database in personal computer **606** so that the contacts database is able to keep updated.

In another embodiment, POA **602** is able to transport recognized texts as well as captured graphic representations to a remote device via a
25 wireless network **608**. In this embodiment, POA **602** is equipped with a transceiver to communicate with wireless network **608**. In addition, POA **602** may be equipped with various interfaces such as it can properly communicate with other computing devices **610**. In one embodiment, POA **608** has an infrared (IR) port that can communicate with a printer or fax
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5 machine that is also equipped with an IR port. Through the infrared, data (e.g. recognized texts or graphic images) could be transported to the printer or the fax machine. In essence, POA **602**, as the name suggests, provides some of the basic office utilities.

10 **Figure 7** is flow diagram of the process **700** associated with the rule based processing of the captured components in accordance with an embodiment of the present invention. At **704** a determination is made as to whether a component being processed is comprised of character strings (i.e., text). If a text component is detected then it is processed using optical character recognition (OCR) at **712** and matched to a template filter at **716** where pre-defined string types (i.e., names, phone numbers and e-mail addresses, etc.) are identified for special processing with the results of processing being displayed at **748**. At **720** a determination is made as to whether the captured component is a fingerprint. If the image is a fingerprint then a transform image (i.e., Fourier Transform image) is generated at **728** and if identity confirmation is required (**732**) then the transformed image is forwarded to a certification authority (**736**) for processing and a confirmation message is generated at **740** with the results being displayed at **748**. If the image is neither text nor a fingerprint image
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 25 then it is processed as a general image at **724** with the results being displayed as required at **748**.

The present invention has been described in sufficient detail with a certain degree of particularity. It is understood to those skilled in the art that the present disclosure of embodiments has been made by way of examples only and that numerous changes in the arrangement and combination of
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5 parts may be resorted without departing from the spirit and scope of the
invention as claimed. While the embodiments discussed herein may appear
to include some limitations as to the presentation of the information units, in
terms of the format and arrangement, the invention has applicability well
beyond such embodiment, which can be appreciated by those skilled in the
10 art. Accordingly, the scope of the present invention is defined by the
appended claims rather than the forgoing description of embodiments.

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